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Tracking Down Elusive Customers: The Fredericton Mall Survey

by

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RÉSUMÉ

Les modèles de flux piétonniers sont un outil des plus utiles pour la planification de centres d'achats. Les résultats qu'ils produisent peuvent être utilisés pour identifier les zones mortes à l'intérieur de centres existants ou pour la planification de nouveaux centres. Cet article décrit les résultats d'une enquête effectuée au Fredericton Mall (Nouveau-Brunswick, Canada). On montre que le type de données recueillies lors de cette enquête peut effectivement être utilisé pour reconstruire les flux piétonniers. De plus, des informations utiles sur le comportement des clients peuvent être obtenues à partir de ces résultats.

Mots-clés: Centres d'achats; flux piétonniers; enquêtes sur le comportement des clients.

Abstract

Transferable pedestrian flow models are a useful tool for the planning of shopping malls. Their results can be used to identify dead areas in existing shopping centers and to plan new malls. This article reports the results of a survey conducted at the Fredericton Mall in New Brunswick, Canada. It is shown how the type of data collected can be used to reconstruct pedestrian flows. Moreover, valuable information on shoppers' behavior can be extracted from the results.

Keywords : Shopping malls; pedestrian flows; shoppers' behavior surveys.

Introduction

Shopping malls have become commonplace in many developed countries of the world and hundreds of new malls are opened each year. Designing shopping malls requires careful planning. Questions such as marketing demographics, location, building costs and expected revenues must be examined. A floor plan must be established and an appropriate mix of tenants must be selected, see Bean, Noon, Ryan and Selton (1988). One important planning problem is to adequately locate stores in relation to one another to achieve sufficient traffic flow through all areas of the mall, see Baron (1991) and Lion (1976, p. 34). For this, information on pedestrian traffic flow in comparable malls is required. But, as rightly observed by Baron, designing a workable pedestrian flow model is a difficult task and there is no universally accepted methodology to achieve this.

The question we attempt to answer in this paper relates to customers' shopping trips for a given and existing mall design. In other words, we try to find out where customers go, and where they spend money. Various approaches to answering this question could be considered. Theoretically, it might be best to follow individual shoppers through the mall, noting where they browse, where they buy

and how much they spend. This approach is, however, hardly feasible. Secondly, one could count the number of passersby at certain spots in the mall. Although this technique clearly measures customer traffic, it will not provide customer shopping patterns. A third possibility would be to ask customers who enter the mall, which stores they intend to patronize. This method has the disadvantage of not being able to deal with customers who just browse. Fourthly, one could ask customers leaving the mall which stores they actually patronized. The problem with this approach is that many customers may not remember all the stores they have looked into (would window shopping qualify?) and even if they do, was there any serious attempt to buy or just general interest? The fifth and last approach is to interview customers leaving the mall regarding their actual purchases. This method is quite reliable as most customers do remember where they spent money. It is the approach taken in this study.

There are, however, some drawbacks. It would be more informative to also question customers about the amounts of money spent in the different stores as otherwise the purchase of a package of band aids would count just as much, (viz. one purchase) as an expensive piece of clothing or jewelry. Another problem with this, as well as some of the other approaches, is the question of whether the number of individual shoppers or the number of shopping groups should be counted. The underlying question is: If x customers shop together in a group, do they spend x times as much as any single one of them would have? If the answer is yes, then it would be justified to count the number of customers. Otherwise the number of groups appears to be a more valid measure. In our study we recorded both individuals and groups, but later decided to count only the groups. The reason for this is as follows. Most groups consist of family members, e.g., husband and wife, and if they shop together, it appears unlikely that they spend twice as much as if one of them had gone shopping alone. If a couple or other group split up and individuals of this group shopped in different stores, we counted them as one group each, regardless of whether they returned together or not.

Depending on mall design, knowledge of the stores that were patronized, may enable the analyst to reconstruct the shopping trip of a customer. This is easily done in malls which are linear, i.e., basically a long hallway with stores and a few entrances on both sides. It is also possible in malls which exhibit a tree structure, meaning essentially that there is exactly one route between any pair of locations in the mall. Malls that do not have this design but more complicated floor plans (see e.g., Carpenter, 1974) are considerably more difficult to analyze, and a simple reconstruction of shopping trips from knowledge of the stores that a customer has patronized is no longer possible.

It may be worthwhile to point out that of the 14 major shopping malls in the three largest cities in New Brunswick, only one is linear, 8 have a tree structure, two are unicyclic, i.e., almost trees, and the remaining 3 have more general floor plans. For simplicity of the analysis, we have chosen the only linear mall for our study. This is, however, not quite as restrictive as it may sound as a large number of so-called strip malls exist which are almost all linear. It is, however, not certain whether shoppers walk and plan their trips the same way for strip malls as they do in the case of enclosed malls.

The Design of the Fredericton Mall Survey

The Fredericton Mall is one of the three major shopping malls in Fredericton, New Brunswick. It is a linear shopping center with a foodstore and a department store as anchors at the ends. There are sixty stores in between plus a number of kiosks, some temporary and some permanent. There are four regular entrances to the mall, in the following referred to as A, B, C, and D, as well as entrances through the two anchors, the drug store in the middle of the mall, and a back door which is almost excusively used by employees. Figure 1 shows the shape of the mall as well as its entrances.

Figure 1 about here

We received permission to survey the four regular entrances A, B, C, and D. The remaining entrances were unobserved. This implies that our data underestimate the real number of shoppers at the two anchors and, to a lesser extent, the stores in their vicinity.

The survey took place during the two weeks between Monday, July 22 and Saturday, August 3, 1991. The mall opens from 10 a.m. to 10 p.m., six days a week. Each workday was subdivided into ten one-hour time slots during which interviews would be conducted. The time between these slots gave the interviewers a break and enabled them to walk from one exit to another. In order to avoid a situation in which the same small time slots were unobserved day after day, the one-hour observation slots were moved forward and back each day. The interviewers were assigned to exits, so that during the two weeks in which the study was carried out, each exit was observed exactly three times during each time slot. Furthermore, on each weekday, each entrance was observed five times in the course of the study. Also, no entrance was observed during only one week in a specific time slot, and no entrance was observed during two time slots in a row. This design of the study was followed until, in the middle of the second week, exit C was closed for major construction work in this area of the mall. This renovation lasted several months and changed the entire layout of the mall: even though entrance C was reopened, entrance B was closed permanently and the linear design of the mall was changed to a tree-shape.

The timing of the interviews was as follows. Except for the break periods, one interviewer was constantly present at one of the four exits of the mall. For three half-days during the first week, a third assistant observed the same exit as the interviewer and recorded the number of shoppers leaving the mall. These data were later used to determine the proportion of shoppers that were actually interviewed in relation to the number of shoppers leaving the mall through this exit. With this design of the survey, the entire data collection cost was less than $2,000 (Canadian).

The Results of the Survey

The evaluation of the results showed that the sample was of size n = 4,654. This figure denotes the number of groups of customers which were actually interviewed. The proportion of customers which were interviewed in relation to the total number of customer groups entering the mall was 57.27%. In other words, we estimate that about 8,000 customers passed by our interviewers during the two weeks of the field study. As interviewers were positioned at only one of the four entrances at each point in time, the number of shoppers can be expected to be four times that many - plus those who left the anchors directly, left the mall through the drug store or the back door, as well as those who left during the times when our interviewer had a break. We should also note that the proportion of interviewed customers was slightly higher when traffic was slow as only a certain number of interviews can be conducted per time unit.

As in each survey, a certain proportion of the customers refused to be interviewed. In our study, this proportion was 9.54% which was quite independent of the time slot. Based on the limited data of our control group, we found that the number of customers leaving the mall was fairly stable throughout the day with lows just before noon and between 3 and 4 pm. It is worthwhile to note in this context that the average number of interwiews per one-hour time slot was 42.03, 41.56, and 40.70 at exits A, B, and D and only 28.29 at exit C - interestingly the exit which was closed later for remodeling the mall. Furthermore, we observed that an average of 87% of the customers left the mall through the same entrance they came in.

Another interesting result concerns the average number of stores in which a customer makes purchases. With 60 stores and two anchors, the mall does provide quite a bit of variety and we expected the average customer to make purchases in, say, three or four stores. The results taught us otherwise. They are summarized in Table 1.

Table 1: Proportion p of Customers Making Purchases in k Stores

k	0	1	2	3	4	5	6	7	>7
p	14.12%	50.33%	25.70%	7.12%	1.72%	0.60%	0.34%	0.06%	0%

In other words, the average number of stores in which a customer spent money is 1.35 and 90% of the customers patronized 2 stores or less. This appears to indicate that shoppers do not make elaborate plans in their buying decisions but rather drive to the mall when they need something. Even the fact that purchases at the two anchors can satisfy various needs in one purchase (and are thus in some sense comparable to multiple-store purchases elsewhere in the mall) does not necessarily invalidate the above argument: customers whose primary plan is to patronize one of the anchors are likely to enter and leave the mall through one of the doors leading directly to the anchor. Such customers are not counted in our study.

In all malls, and the Fredericton Mall is certainly no exception, some stores capture a large part of the market, whereas others are patronized by only a few customers. One possibility for displaying these differences is the use of the Lorenz curve, see e.g., Fischer, Dornbusch and Schmalensee (1988). This graph is frequently employed in economics where, for example, the proportion of national income is plotted against the proportion of the population. In our shopping mall example, we plot the proportion of the number of purchases (but not the sales volume) against the proportion of stores. The Lorenz curve for the shopping mall results is displayed in Figure 2.

Figure 2 about here

As an example, 53% of the stores in the mall account for only 14.5% of the number of purchases and 77% of the stores account for 32% of the purchases. On the other hand, customers made 39% of their purchases in the mall in just 3 (= 4.5%) of the

stores. In order to display these data, we chose to use the Gini index; for further details see, for example, Bannock, Baxter and Davis (1987). This index measures inequalities of data and it assumes a value of G = 0 in case of total equality of the proportion of purchases and G = 1 in case of total inequality. In our study, the Gini index was computed as G = 0.6.

Finally, we analyze individual parts of the mall with respect to the number of customers that are exposed to them. This type of analysis is particularly important in order to identify dead areas. For that purpose, we reconstructed the trips made by individual shoppers. This is where the simple shape of the Fredericton Mall makes the analysis convenient. Still, we can only utilize the information regarding the stores where customers actually made purchases and reconstruct their shopping trips from this information. This is done as follows. We map the stores onto a line segment with the anchors at the ends and the stores as well as entrances represented as points on the line in the appropriate positions. For each set of stores and entrances used by at least one customer, we identified all points visited on the line. All stores located between the leftmost and rightmost points visited by a group of shoppers have been passed by and seen by the shoppers and thus could make a sales pitch to them via their displays. By superimposing the shopping trips of all customers in our study, we obtain a lower bound on the number of customers who have passed by and thus were exposed to each store in the mall. The absolute magnitude of these numbers should not be used - this would be meaningless as the actual trips of customers are only approximated - but the numbers should be considered in relation to each other. In a frequency polygon such as the one in Figure 3, extended areas with low proportions of passersby would indicate less frequented parts of the mall. To avoid this, mall administrators may wish to attract high volume stores to such areas in order to revive these parts of the mall.

Figure 3 about here

The arrows in the figure indicate the locations of the four doors. Figure 3 hows that there are no dead areas in the Fredericton Mall. This result was to be expected in a linear shopping center. The smaller frequencies towards the ends of the mall can be explained by the missing data that resulted from the non-observation of the anchors' exists. A similar reasoning applies to the higher frequency found at one point towards the right end of the mall. Here is a large store with its own exit, which was not observed by us. Customers, who entered through that door, shopped only in this store, and left through the same door, account for the considerably higher exposure of this store.

Conclusion

In this paper we have examined the behavior of shoppers regarding their purchases in a shopping mall. The basis for our findings are a two-week survey in one of the major shopping malls in Fredericton, New Brunswick, Canada. We have proposed a transferable methodology to estimate shopping patterns in shopping malls and to reconstruct pedestrian flows using these data. This provides a useful tool for identifying dead areas within malls. Moreover, the proposed methodology can help design new shopping centers, based on data obtained from comparable malls.

Valuable additional information can also be derived from this type of survey. Thus, at the Fredericton mall, it was observed that

- almost 90 percent of the customers leave the mall through the same entrance they came in,
- 90 percent of shoppers spend money in 2 stores or less, and
- three of the stores in the mall account for 40 percent of the number of purchases - most likely this figure is considerably higher as the exits at the anchor stores could not be observed.

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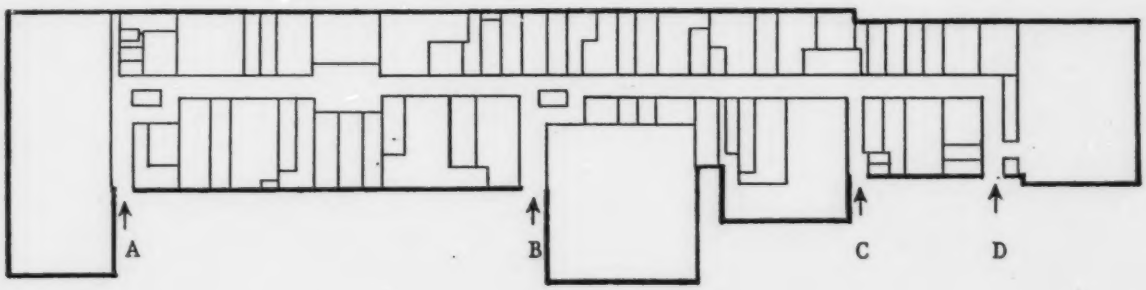

Figure 1: Floor plan of the Fredericton Mall

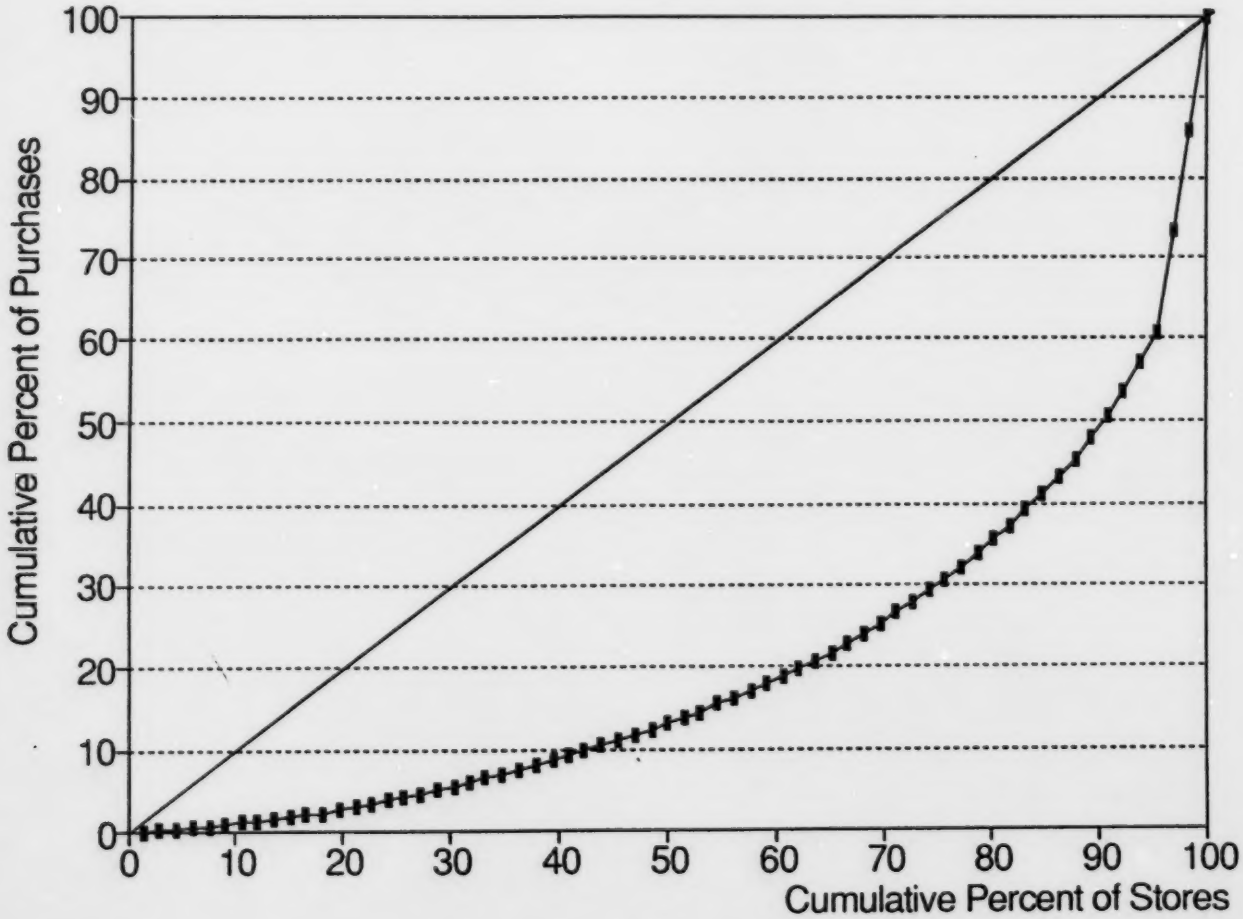

Figure 2: Cumulative shopping frequencies

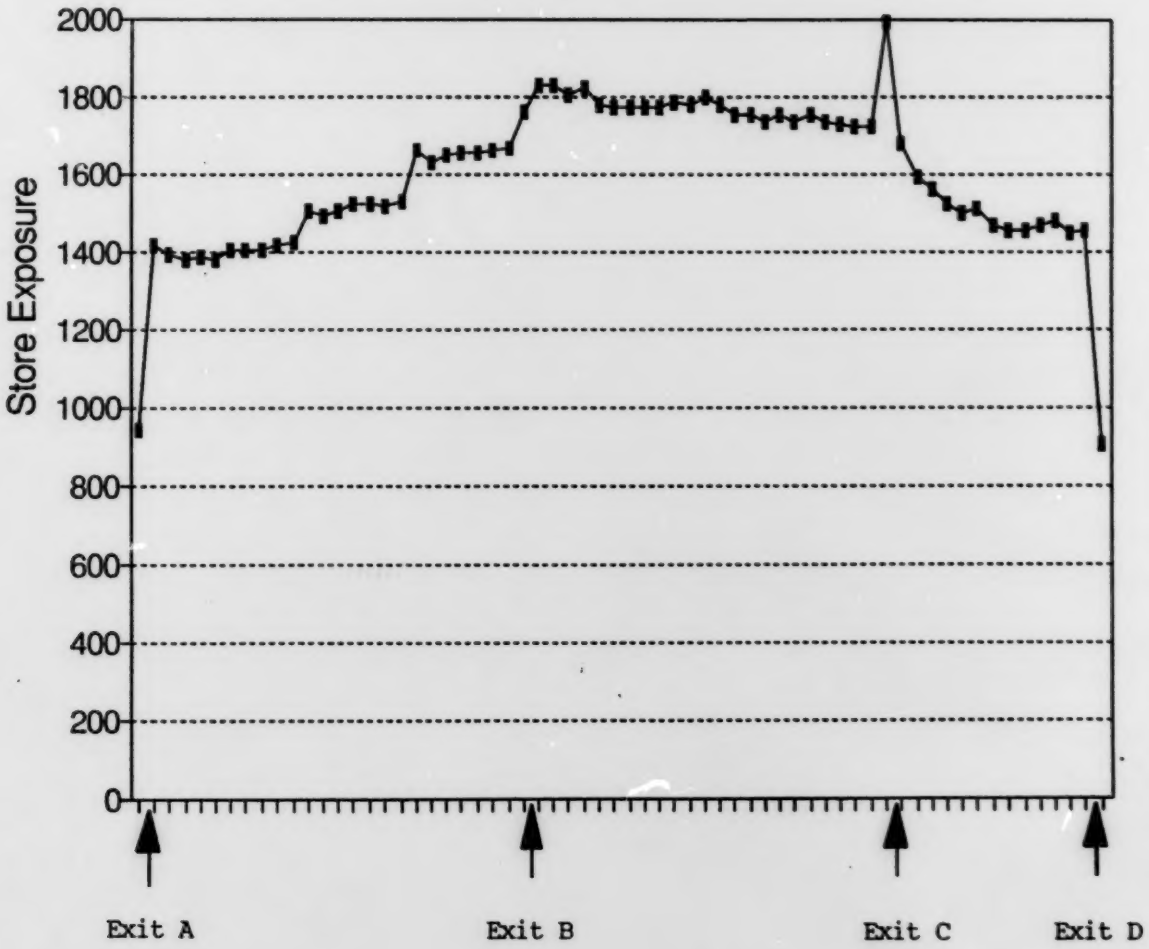

Figure 3: Exposure of stores in the Fredericton Mall